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Keywords

Saxophone, Adolphe Sax, Performance practice, Instrument design, Music history

Publication Statement

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Establishment of the Classical Saxophone: The evolution of instrumental design and performance into the 20th century

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Abstract

The instrumental design of the saxophone has evolved dramatically from its original patent in 1846. Referencing instruments from the St. Cecilia's Hall Music Museum at the University of Edinburgh, this article explores the historical origins of the saxophone and traces the evolution of its design into the 20th century. Original research was completed through analysis of unique antique saxophones at St. Cecilia's Hall and historical source materials in order to determine how, despite its intention to be used as a classical instrument, many factors such as politics, instrument structure, finances, and musician attitude at the time of the saxophone's invention resulted in limited classical saxophone performance in the modern day. This article addresses the importance of exploring the early history of instruments as an aspect of contemporary musical study.

Keywords: saxophone – Adolphe Sax – performance practice – instrument design – music history

1 INTRODUCTION

First officially patented in 1846, the saxophone is the most recently invented Western instrument that is written with frequency into modern orchestral and wind ensemble compositions. Due to its relative novelty, as it was not invented until the Romantic period of music, the amount of repertoire existing for solo and ensemble classical saxophone compared to most traditional instruments is limited. In addition, the popularity of saxophone in jazz and rock overshadows its origin and usage as a classical instrument. Despite its lack of extensive recognition, the repertoire and schools of classical saxophone study are still vital to historical understanding of the instrument and remain a versatile area of musical performance. This article contains original research on the complexity of the evolution of saxophone design since Adolphe Sax's initial patent and will focus on the progression of alterations to the alto saxophone that allow for the virtuosity of performance that classical saxophone repertoire requires today. The progression of saxophone design will be traced through unique historical instruments from St. Cecilia's hall. In addition, this article will explore the causes of diminished popularity of the saxophone as a classical instrument from a historical perspective. This analysis of causes for the low prevalence of classical saxophone will include original research forming connections between

instrumental design with historical factors.

2 THE ORIGINAL SAX PATENTS

Adolphe Sax initially invented the saxophone as a melodic low woodwind that could imitate the timbre of orchestral strings but had the volume of brass instruments. In the original patent, Sax states that "the character of [the saxophone's] voice can be reconciled with the stringed instruments, but which possesses more force and intensity than the strings"¹. The bassoon and the bass clarinet (which Sax himself had invented in 1838) were both too quiet for large concert settings, especially outdoors, and low brass instruments lacked the consistency of tone and technology to play quick melodic passages². One popular theory behind Sax's inspiration for the saxophone was that he combined his work optimizing the bass clarinet with the work of his father. Charles-Joseph Sax had the title as the "Musical Instrument Maker of the King of Brussels" and spent the majority of his efforts designing ophicleides². Until the invention of the saxophone, the ophicleide attempted to fill the gap, but was not ideal as it lacked a functional lower range, stood out from the rest of the orchestral sound, and maintained poor intonation.

There has been some confusion when observing the original Sax patents about which instruments had ac-

tually been finalized and physically realized as part of Sax's saxophone family. The 1846 patent, seen in Figure 1, shows eight total saxophone models, but only *no.1* and *no.2* in the diagram have any detail in design. This would imply that the very first saxophones that Adolphe Sax actually created were the $E\flat$ baritone saxophone (*no.1*) and the $C/B\flat$ bass saxophone (*no.2*)³.

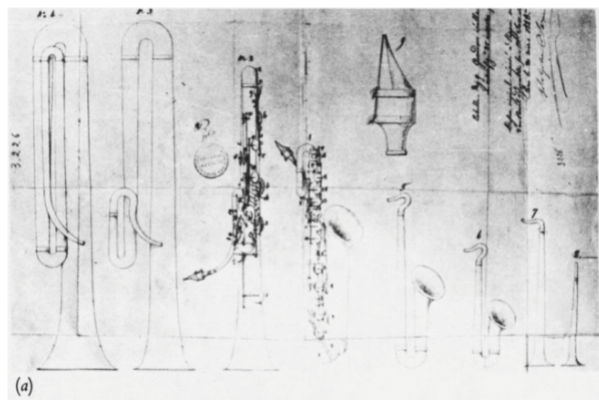


Figure 1. Adolphe Sax's original 1846 saxophone family patent³

These initial patented models gained massive popularity in the French military band, which required the volume and dexterity that Sax provided, but the man was shortly to fall on hard times. Sax's rivals claimed that there was too much similarity between the saxophone and the ophicleide, especially since the original bass saxophone still retained the ophicleide shape. Along with being drawn into lawsuits against competitors designing their own types of "saxophones", Sax lost his foothold in the French military band as King Louis Philippe, who's favor he had gained, was deposed in 1848, and saxophones were removed from the standard instrumentation^{2,4}. Although fiscally devastating, this period of misfortune allowed Sax the time to develop his designs. He attempted to move the saxophone even further from the ophicleide by adjusting the position in which saxophones were held and spent time expanding upon and finalizing the different members of his saxophone family. In Figure 2, his 1850 Belgium patent shows a four-part saxophone family that is recognizable today: *no.1* – $B\flat$ soprano saxophone, *no.2* – $E\flat$ alto saxophone, *no.3* – $B\flat$ tenor saxophone, and *no.4* – $E\flat$ baritone saxophone³. This patent also contained designs for an $E\flat$ sopranino and a C bass saxophone². By utilizing the resources at the instrument museum at St. Cecilia's Hall at the University of Edinburgh, the earliest model alto saxophone I was able to observe was an 1856 Adolphe Sax alto, and this allowed me to document differences between Sax's original conception of the alto saxophone in comparison to subsequent designs.

Sax's original design is by no means a simple instrument. He was extremely interested in acoustic efficiency,

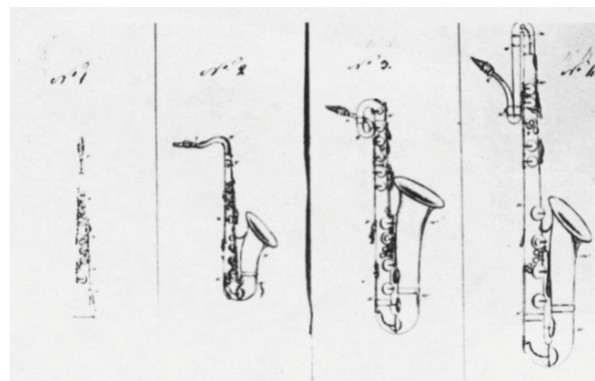


Figure 2. Adolphe Sax's 1850 saxophone family patent³

which can be observed in the carefully constructed bore of the saxophone. Both the bassoon and oboe also have conical bores, but Sax's design was unique as the changing diameter of the saxophone is not consistent but rather parabolic in order to maximize the reflection of soundwaves within the instrument. By including three other smaller parabolic curves within the body of the instrument, Sax was able to most efficiently project the volume of the saxophone while creating its unique bright and sonorous timbre¹. He also claimed that this parabolic shape allowed the saxophone to be "able to change the volume of its sounds better than any other instrument"¹. The original key system, although not as layered as modern saxophone key systems, was inspired by the latest in instrumental technology: the Boehm flute. Theobald Boehm created a key system in 1832 that placed large-bore tone holes in their most acoustically accurate locations on the instrument, using pivoting rods to mechanize keys together^{2,5}. This made more ergonomic sense for performers as they were able to press a key that was within easy reach to open or close the actual tone hole from a distance. By utilizing Boehm's key system, Sax was able to create his saxophone with more accurate intonation throughout its length and allow for more dexterity of playing compared to the ophicleide, for example, which had a separate lever for each key². The acoustics of Sax's original design may have favored the lower register of the saxophone, sacrificing higher harmonies due to minor misalignments of tone holes compared to modern saxophones². This is likely due to its initial conception as a low register woodwind. Compared to the virtuosity that modern saxophonists tend to emphasize for the higher registers of the saxophone, early saxophone performance and compositions likely preferred the lower registers due to intended usage and instrumental design.

Once composers realized that the saxophone could perform parts written for its middle and upper registers with a more pleasing acoustic result, instrumental de-

sign began to shift to allow for clearer high harmonies. By the turn of the century, compositions for this instrument were able to be more complex and more interesting to both perform and listen to as fast passages are significantly easier to play on the higher registers of a saxophone.

3 EARLY USAGE OF THE SAXOPHONE

Initially finding its place in French military music, the range of early saxophone repertoire was small and mostly written by personal friends and acquaintances of Sax. Hector Berlioz was one of the first and most avid advocates for Sax's new instrument family, providing the material for the saxophone's first public performance in 1844². Adolphe Sax himself played the bass saxophone for Berlioz's *Chant Sacré* orchestrated as a "Hymne pour les instruments de Sax", and this initial performance was praised as "a victory gained by Mr. Sax" by composer George Kastner². Kastner proceeded to include the bass saxophone in his opera *The Last King of Juda* later that year, claiming to have written the first orchestral setting for saxophone. The first saxophone method book, *Complete and Systematic Method for the Saxophone*, was written in 1846 by Kastner, who was now one of the saxophone's most vocal supporters². Early performances of compositions such as *Chant Sacré* and *The Last King of Juda* confirm that Sax initially intended for the saxophone to remain a bass voice blending with the rest of the orchestra. This is very different from the modern use of saxophones as a melodic, soloistic instrument.

Instruction in saxophone performance began shortly after its 1850 redesign and subsequent growth in popularity as Adolphe Sax himself was instated as a professor at the Paris Conservatory in 1857¹. As Sax realized the soloistic potential of his instruments, he wished to increase the amount of repertoire available to his students and created a publishing house for new saxophone works in the 1850s¹. Prominent composers rose to the occasion, the most well-known being Joseph Arban, Jules Demerssen, Hyacinthe Klosé, and Jean-Baptiste Singlelé⁶. Works by these composers are still occasionally played today, but do not make up the majority of a modern classical saxophonist's repertoire. These early works are relatively limited in range and complexity compared to later saxophone compositions, and this has been attributed to the small number of passionately virtuosic early saxophonists. Due to its novelty, the saxophone was often seen as something that could be quickly learned as a secondary instrument and few, outside the Conservatory, took the time to become proficient. Thus, early composers would still include saxophone in their works, but almost always wrote out doubled parts in different instruments in case an adequate player could not be found⁶.

Another reason that may have limited the growth of the saxophone into the orchestral realm was that early composers would tend to write parts for the saxophone in primarily its lowest register and at very soft dynamics⁶. Due to the instrument's conical shape, it is significantly harder to play quiet low notes than in the middle or high registers. This differs from the ease of playing low notes on straight bore woodwinds such as the clarinet, and likely dissuaded early composers and players alike from taking the saxophone more seriously as a classical instrument.

4 EVOLUTION OF DESIGN

As the alto saxophone slowly grew in popularity as a solo instrument as more people learned about it, the design of the instrument changed to accommodate quicker passages, provide an increased range, and improve tone at the higher end of the instrument. Between the 1856 and 1869 Adolphe Sax alto saxophones I viewed at St. Cecilia's, the diameter of the bore of the instrument was decreased both distally and proximally. Sax had continued to decrease the size of the bell relatively consistently throughout his production of instruments, and this change from the original patent continued. Difference in bore and bell size can be observed in Figure 3, through comparison between the bell of a modern saxophone, such as my own 21st century 991 Yanagisawa alto, and the 1856 Adolphe Sax alto. The reason behind this change is that less material is used when building a smaller bell, and it is less likely to be damaged².



Figure 3. Bell and bore size comparison between modern 991 Yanagisawa alto (above) and 1856 Adolphe Sax alto (below)

Once Sax's final saxophone patent expired in 1866, other companies were able to build upon his original design and add many of the different features that modern saxophones still maintain today¹. The ability for competitive invention upon this instrument, allowed

by the patent expiration, drove new innovation in the design of the saxophone. The distinct dual-octave key system that allowed separate venting for the upper and lower register of the octave was changed into a single key mechanism that would automatically change the venting by the end of the 19th century. This difference can be observed when comparing the 1856 and 1869 Adolphe Sax models, Figure 4. and Figure 5. respectively, with the 1901 Evette & Schaeffer (which shortly became Buffet Crampon) model in Figure 9. The single octave key mechanism allows significantly more dexterity when playing as the left thumb does not have to shift keys depending on the location of notes in a passage, but this can also cause some issues as both of the tone holes of the octave key have more tendency to stick in a single key mechanism.



Figure 4. 1856 Adolphe Sax alto dual-octave key system

Another dramatic change that occurred at this time is that some manufacturers altered the original multiple parabolic bore system that made Sax's patent so unique, rather conforming to a standard conical change in bore diameter¹. This consistent conical bore is used in most modern saxophones and indicates that today's saxophone sound has a different timbre than original Adolphe Sax instruments would have produced¹. Other alterations that occurred entering the 20th century include the addition of the bis-B \flat key, the front F key, the side F \sharp key, and rollers between the keys at both pinkies (see supplemental figures for examples of such additions). These changes all allow for greater ease in quick soloistic passages and smoother movement through chromatic runs that became more and more prevalent in classical saxophone compositions. Other adjustments in body and mouthpiece design also allowed for an expanded high altissimo register which quickly became a



Figure 5. 1869 Adolphe Sax alto dual-octave key system



Figure 6. 1901 Evette & Schaeffer (Buffet Crampon) alto single octave key mechanism

standard of proficiency in saxophone performance.

5 CONCLUSION

By observing various unique models of alto saxophones beginning at the year of the instrument's conception to the early 20th century, I observed and traced numerous marked changes that the saxophone has undergone to become the models of instrument recognizable today. Despite the complexity of later saxophone models, the high standard of intention, experimentation, and execution of instrumental design becomes apparent in Adolphe Sax's early patents as well. Early in the sax-

ophone's history, I was able to research how the interactions between instrument design, assumption of instrument capability and usage, availability of passionate, virtuosic saxophonists, and the resulting characteristics of 19th century compositions for saxophone all play a role in the relatively small area of classical saxophone study today. Although few original Adolphe Sax instruments remain in playable condition, alterations in design that impact size, keys, and weight of the instrument indicate that compositions played upon early saxophones would sound and feel different than if played upon modern instruments and would require a period of study for modern saxophonists to attempt to replicate what the initial premieres of saxophone performance may have sounded like. Due especially to the change in bore from original Sax models to today's instruments, which dramatically altered the timbre, proficiency on these early saxophones appears necessary to truly recapitulate the experience of early saxophone performance.

The study of historical instruments is vital to a complete comprehension of contemporary musical performance and academia. The history of an instrument explains modern design, the extent and diversity of repertoire available for such an instrument, the style of ensemble that instruments are commonly placed into, and the cultural context and impact of instrumental innovation. By studying the past, a greater understanding of the present is attained, as well as new appreciation and value of the progress made.

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7 EDITOR'S NOTES

This article was peer reviewed.

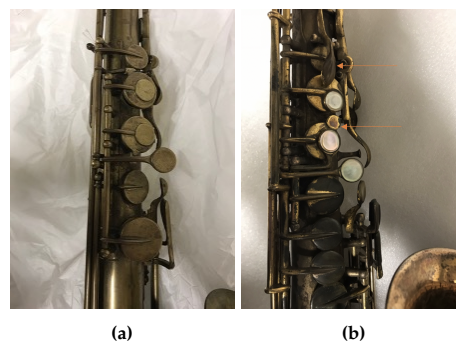


Figure 7. Addition of bis-Bb key and front F key. **A** Primary left-hand keys of 1869 Adolphe Sax alto. **B** Primary left-hand keys of 1901 Evette & Schaeffer (Buffet Crampon) alto, highlighting addition of front F (top arrow) and bis Bb keys (bottom arrow)

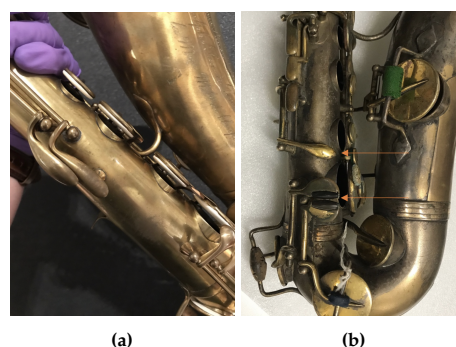


Figure 8. Addition of side F# key. **A** Right-hand side C and Bb keys of 1856 Adolphe Sax alto. **B** Right-hand side keys of 1901 Evette & Schaeffer (Buffet Crampon) alto, highlighting addition of side F# key (top arrow) and rollers between R4 Eb and C keys (bottom arrow)



Figure 9. 1901 Evette & Schaeffer (Buffet Crampon) alto single octave key mechanism

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